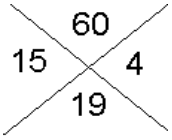
Quadratics **Study Guide**

TRINOMIAL FACTORING		
How? ax^2+bx+c -Use x-factor to find two numbers that multiply to ac and add to b. -Replace bx with the two answers from your x-factor (multiplied by x). -Take the GCF of the first two terms and the GCF of the second two terms. -Write your answer: (what's in parenthesis)(what's not)	#1 $x^2-13x+42$	#3 $10x^2+7x-6$
Ex.$5x^2+19x+12$  $5x^2+15x+4x+12$ $5x(x+3)+4(x+3)$ $(5x+4)(x+3)$	#2 $9x^2-25$	#4 Find the length and width of a rectangle with an area of $A=3x^2-x-10$.

SOLVE BY FACTORING		
How? $y=ax^2+bx+c$ -Get all terms on the same side. -Factor. -Set each factor equal to zero and solve.	#1 $a^2+5a+6=0$	#3 $2x^2-x=1$
Ex. $x^2-11x+19=-5$ $+5 \quad +5$ $x^2-11x+24=0$ $(x-8)(x-3)=0$ $x-8=0 \qquad x-3=0$ $+8+8+3+3$ $x=8x=3$	#2 $k^2-10k+22=-2$	#4 The product of two consecutive negative integers is 1122. What are the numbers?

SOLVE BY GRAPHING		
How? $y=ax^2+bx+c$ -Get the quadratic in standard form. -Graph the equation in y1 on your calculator. -Graph y2 = 0 -Press second ->trace -> intersect - Enter -> Enter -> go to your guess -> enter -Repeat for your second root.	#1 $a^2-a-6=0$	#4 Mr. Walsh's free throw is modeled by the equation$h(x)=-16x^2+20x+6$, where $h(x)$represents the height of the ball and x represents the time in seconds after the ball is shot. When does it land?

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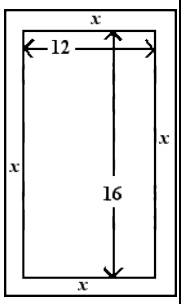
SOLVE BY QUADRATIC FORMULA		
How? $y = ax^2 + bx + c$ -Get in standard form. -Plug into quadratic formula $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ -Simplify	#1 $3x^2 - 8x = 11$	#2 $2x^2 - x = 1$
Ex. $2x^2 + 3x - 4 = 0$ $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ $$x = \frac{-3 \pm \sqrt{(3)^2 - 4(2)(-4)}}{2(2)}$$ $$x = \frac{-3 \pm \sqrt{9 + 18}}{4}$$ $$x = \frac{-3 \pm \sqrt{27}}{4}$$ $$x = \frac{-3 \pm 3\sqrt{3}}{4}$$	#3 $4k^2 + 25k - 21 = 0$	#4 A garden measuring 12 meters by 16 meters is to have a pedestrian pathway installed all around it, increasing the total area to 285 square meters. What will be the width of the pathway? 
COMPLEX ROOTS		
Complex Numbers Format: $a + bi$ where a is the real part and bi is the imaginary part. $$i = \sqrt{-1}$$ $$i^2 = -1$$	#1 $k^2 + 2k + 5 = 0$	#2 $2k^2 - 5k + 7 = 0$
Ex. $4x^2 - 2x + 3 = 0$ $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ $$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(4)(3)}}{2(4)}$$ $$x = \frac{2 \pm \sqrt{4 - 48}}{8} \; x = \frac{2 \pm \sqrt{-44}}{8}$$ $$x = \frac{2 \pm 2i\sqrt{11}}{8}$$ $$x = \frac{1 \pm i\sqrt{11}}{4}$$	#3 $k^2 - 3x + 5 = 0$	#4 $2k^2 + 7x - 4 = 0$

COMPLETE THE SQUARE TO FIND VERTEX FORM

How? $y = ax^2 + bx + c$
-Get in $y - c = ax^2 + bx$ form.
-Divide each term by a.
-add $\left(\frac{b}{2}\right)^2$ to both sides
-factor the right to $\left(x + \frac{b}{2}\right)^2$
-solve for y

Ex. $y = 2x^2 - 4x + 4$

$$-4 \quad -4$$
$$y - 4 = 2x^2 - 4x$$
$$\div 2 \quad \div 2 \quad \div 2$$
$$\frac{y}{2} - 2 = x^2 - 2x$$
$$+1 \quad +1$$
$$\frac{y}{2} - 1 = x^2 - 2x + 1$$
$$\frac{y}{2} - 1 = (x-1)^2$$
$$+1 \quad +1$$
$$\frac{y}{2} = (x-1)^2 + 1$$
$$\cdot 2 \quad \cdot 2 \quad \cdot 2$$
$$y = 2(x-1)^2 + 2$$

#1 $y = x^2 - 4x + 6$

#2 $y = 2k^2 + 10k + 8$

#3 $2x^2 - 5x + y = 3$

Suppose there is an arch that follows the equation

$$F(x) = -\tfrac{1}{70}x^2 + 6x.$$

How far apart are the ends of the arch?

SOLVING RADICAL EQUATIONS THAT HAVE EXTRANEOUS SOLUTIONS

How? $\sqrt[a]{(x+b)^c} = x + d$
-Get rid of the radicals by raising to the reciprocal power (don't forget to distribute if squaring (x+d))
-solve for x by any method
-check for extraneous solutions by plugging in your answers to the original equation (if it doesn't work, its extraneous)

Ex. $\sqrt{x-1} = x - 7$

$$\sqrt{x-1}^2 = (x-7)^2$$
$$x - 1 = (x-7)(x-7)$$
$$x - 1 = x^2 - 14x + 49$$
$$-x \quad +1 \qquad -x \quad +1$$
$$0 = x^2 - 15x + 50$$
$$0 = (x-5)(x-10)$$
$$x = 5, x = 10$$

Now test each solution in the original equation.

$$\sqrt{5-1} = 5 - 7$$
$$\sqrt{4} = -2$$
$$2 = -2$$

FALSE! Extraneous

$$\sqrt{10-1} = 10 - 7$$
$$\sqrt{9} = 3$$
$$3 = 3 \ true$$

#1 $\sqrt{x-2} = 5$

#2 $\sqrt{c-5} = c + 1$

#3 $b - 6 = \sqrt{18 - 3b}$

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WRITING EQUATIONS FROM ZEROES

How? $x = -3 \quad x = {}^{2}/_{3}$
-multiply then add or subtract to move everything to the left side.
-multiply the left sides together

Ex. $x = -3 \quad x = {}^{2}/_{3}$ $+ \quad 3 \quad \cdot 3 \quad \cdot 3$

$x + 3 = 0 \quad 3x = 2$

$-2 \quad -2$

$x + 3 = 0 \quad 3x - 2 = 0$

$(x + 3)(3x - 2)$

$3x^2 + 9x - 2x - 6$

$3x^2 + 7x - 6$

$y = 3x^2 + 7x - 6$

#1 $x = 2 \quad x = -4$

#2 $x = -1 \; x = {}^{3}/_{5} \; x = 1$

#3 $x = \frac{1}{4} \quad x = -\frac{4}{3}$

#4 A person dives off of a board into the water. She goes under 2 seconds after diving and resurfaces 4.5 seconds after diving. Write an equation to represent the time that she was underwater (no decimals).

QUADRATICS OF BEST FIT

How?

x-value	a	b	c
y-value	d	e	f

-stat -> edit -> type x-values in L1 and y-values in L2.
-stat->calc->quadreg->vars-> y-vars-> function-> y1 -> enter
-To find an x-value, type the given y-value into y2= and 2nd ->trace -> intersect ->enter ->enter->enter
-to find a y-value, 2nd -> trace -> value -> type given x-value -> enter

#1

x	-1	0	1	2	4
y	6	1	-2	2	21

What is x when y=3?

What is y when x=-2?

#3

time	0	1	3	4
height	0	13	100	200

What is the height after 12 seconds?

At what time(s) would the object be 490 feet high?

FOCUS AND DIRECTRIX

How? $(y - k) = \frac{1}{4p}(x - h)^2$
-remember (h,k) is the vertex. P is the distance from the vertex to the focus.
-plug in your information or gather your information from this equation.

Ex. Write an equation for a parabola with a directrix of $y = -3$ and a focus of (5,7)

Vertex at (5,2) and $p = 7 - 2 = 5$

$$(y - k) = \frac{1}{4p}(x - h)^2$$

$$(y - 2) = \frac{1}{4(5)}(x - 5)^2$$

$$(y - 2) = \frac{1}{20}(x - 5)^2$$

#1 Find the focus, directrix, and vertex of

$$(y - 2) = \frac{1}{8}(x + 3)^2$$

#2 Write an equation for a parabola with a directrix of $y = 2$ and a focus of (3,0)

#3 Find the focus, directrix, and vertex of

$$y = 3(x + 2)^2 - 5$$

#4 Find the focus of a quadratic with a vertex of (3,-5) and a directrix of $y = -9$